

EXHIBIT 15

Expert Report of Suresh Moolgavkar, M.D., Ph.D.

In re W.R. Grace & Co., *et al.*

October 3, 2006

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Suresh Moolgavkar, M.D., Ph.D., is currently Full Member, Fred Hutchinson Cancer Research Center, Professor of Epidemiology and Adjunct Professor of Biostatistics and of Applied Mathematics, University of Washington. Dr. Moolgavkar has more than 25 years of experience in the fields of epidemiology, biostatistics and quantitative risk assessment. He is internationally known for his work in developing mechanistically based dose-response models for carcinogenesis, and, in particular, for the two-mutation clonal expansion model, also known as the Moolgavkar-Venzon-Knudson (MVK) model. For the past decade Dr. Moolgavkar has also been keenly interested in the analyses of the association between various indices of air pollution and human health effects. Dr. Moolgavkar has served on the faculties of Johns Hopkins University, Indiana University, University of Pennsylvania, and Fox Chase Cancer Center. He has been a visiting scientist at the Radiation Effects Research Foundation in Hiroshima, the International Agency for Research on Cancer in Lyon, and the German Cancer Research Center in Heidelberg. Dr. Moolgavkar has served on numerous review panels and as a consultant to the National Cancer Institute, the Environmental Protection Agency, Health and Welfare, Canada, The International Agency for Research on Cancer, the California Air Resources Board and the CIIT Centers for Health Research, among others. Dr. Moolgavkar is the author or co-author of approximately 150 papers in the areas of epidemiology, biostatistics, and quantitative risk assessment, and has edited three books in these areas. He was the senior editor of a monograph, 'Quantitative Estimation and Prediction of Human Cancer Risk' published by the International Agency for Research on Cancer. He is an elected member of the American Epidemiological Society. Dr. Moolgavkar has served on the editorial board of 'Genetic Epidemiology' and is currently Associate Editor for Health and Environment of 'Risk Analysis - An International Journal'. He was given the Founders' Award by the CIIT Centers for Health Research in 1990 and the Distinguished Achievement Award by the Society for Risk Analysis in 2001.

Dr. Moolgavkar's research has been supported largely by grants from the National Institutes of Health, the Department of Energy, and the Environmental Protection Agency.

Educational Background

M.B.B.S. (M.D.), Bombay University, 1965
Ph.D., Mathematics, Johns Hopkins University, Baltimore, Maryland, 1973
Postdoctoral Fellow, Departments of Pharmacology and Biophysics, Johns Hopkins Medical School, Baltimore, Maryland, 1966-68
Senior Fellow, Department of Epidemiology, University of Washington, 1976-77

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Medical Examinations: ECFMG, FLEX

Visiting Positions

Visiting Scientist, International Agency for Research on Cancer, Lyon, 11/79
Visiting Scientist, Radiation Effects Research Foundation, Hiroshima, 4/81
Visiting Scientist, Fred Hutchinson Cancer Research Center, Seattle, 8/15-12/15/82
Visiting Professor, Department of Biostatistics, University of Washington, 8/15-12/15/82
Visiting Scientist, German Cancer Research Center, Heidelberg, 6/15- 8/15/90

Professional Appointments

Instructor in Mathematics, Johns Hopkins University, 1972-73
Assistant Professor of Mathematics, Indiana University, Bloomington, 1973-77
Associate, American Oncologic Hospital, Philadelphia, 1977-6/84
Clinical Assistant Professor, Department of Research Medicine, University of Pennsylvania School of Medicine, 1977-6/80
Member, Graduate Group in Epidemiology, University of Pennsylvania, 1977-6/84
Epidemiologist, The Fox Chase Cancer Center, Philadelphia, 1977-6/84
Research Physician, The Institute for Cancer Research, Fox Chase Cancer Center, Philadelphia, 7/79-6/84
Adjunct Associate Professor, Department of Research Medicine, University of Pennsylvania School of Medicine, 7/80-6/84
Adjunct Professor, Department of Biostatistics University of Washington, 7/84 – present
Adjunct Professor, Department of Applied Mathematics, University of Washington, 9/04 - present
Professor, Department of Epidemiology, University of Washington, 7/84 - present
Member, The Fred Hutchinson Cancer Research Center, Seattle, 7/84 - present

Awards and Honors

Faculty Research Fellowship of Indiana University, 1974-76
Lester R. Ford Award of Mathematical Association of America, 1977
Founders' Award, Chemical Industry Institute of Toxicology, 1990
Member, American Epidemiological Society
Distinguished Achievement Award, Society for Risk Analysis, 2001

Current Grant Support

NIH/NCI: Biomathematical Approaches to Cancer: 7/1/02 – 6/30/06 (Principal Investigator)

Develop mathematical models of intermediate lesions on the pathway to malignancy and the requisite statistical and computational tools to fit the models to experimental

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and human data.

NIH/NCI: Lung Cancer in the US: Pathogenesis, Trends, Prevention: 9/1/02 – 7/31/06
(Principal Investigator)

Develop mathematical models and statistical and computational tools for analyses of incidence data in cancer registries. Apply the methods to analyses of lung cancer in the SEER database and investigate the effect of smoking cessation on lung cancer incidence.

CDC/NIOSH: Stochastic models for radiation carcinogenesis: temporal factors and dose-rate effects: 9/30/02 – 9/29/05. (Principal Investigator)

This grant proposes to analyze lung cancer in several occupational cohorts exposed to ionizing radiation. The main analytic tools will be based on ideas of multistage carcinogenesis.

NIH/NCI: Modeling Colon Cancer, Intervention and Prevention 1/1/2005 – 12/31/ 2008
(Co investigator; Georg Luebeck, PI)

Development of mathematical and statistical methods for the quantitative evaluation of possible prevention and intervention strategies for colorectal cancer. The tools and methods will be based on stochastic models of carcinogenesis that reflect the biological insights gained into the pathogenesis of colon cancer over the past decade.

DOE: Biologically based multistage modeling of radiation effects: 9/1/2003 – 8/31/2005
(Co investigator; Bill Hazelton, PI)

The goal of this proposal is to model genetic instability, adaptive response, low-dose hypersensitivity, and genetic instability, collaborating through workshops with experimentalists to incorporate these radiation-induced phenomena into stochastic models of carcinogenesis.

Publications

Mathematical (There is no seniority of authorship in mathematical papers.
Authors appear in alphabetical order.)

1. On the existence of a universal germ of deformations for elliptic pseudo group structures on compact manifolds. Transactions of the American Mathematical Society 212:173-197, 1975.
2. On the signature of Fermat surfaces (joint with John Ewing), Michigan Math J 22:257-268, 1975.
3. Euler characteristics of complete intersections (joint with John Ewing), Proc Am Math Soc 56:390-391, 1976.

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4. American mathematics from 1940 to the day before yesterday (joint with John Ewing, E. Gustafson, P. Halmos, W. Wheeler, and W. Ziemer), *Am Math Monthly* 83:503-516, 1976.
5. On a conjecture of Atiyah and Thom (joint with John Ewing), Preprint, Indiana University, 1976.
6. On the group of holomorphic line bundles on an algebraic surface (joint with John Ewing), Preprint, Indiana University, 1976. -
7. Stable parallelizability of lens spaces (joint with John Ewing, Larry Smith, and R. E. Stong), *J Pure and Applied Algebra* 10:177-191, 1977.

Biomedical

8. Jarabak R, Colvin M, Moolgavkar S, Talalay P: Δ^5 -3-ketosteroid isomerase of *Pseudomonas Testosteroni*. In "Methods in Enzymology" Vol. XV, RB Clayton editor, Academic Press, NY, 642-651, 1970.
9. Moolgavkar S: The multistage theory of carcinogenesis. *Int J Cancer* 19:730, 1977.
10. Moolgavkar S, Lee JAH, Hade RD: Comparison of age-specific mortality from breast cancer in males in the U.S. and Japan. *JNCI* 60:1223-1225, 1978.
11. Moolgavkar S: The multistage theory of carcinogenesis and the age distribution of cancer in man. *JNCI* 61:49-52, 1978.
12. Moolgavkar S, Stevens RG, Lee JAH: The effect of age on the incidence of breast cancer in females. *JNCI* 62:493-501, 1979.
13. Moolgavkar SH, Venzon DJ: Two-event model for carcinogenesis: Incidence curves for childhood and adult tumors. *Math Biosci* 47:55-77, 1979.
14. Stevens RG, Moolgavkar SH: Estimation of relative risk from vital data: Smoking and cancers of the lung and bladder. *JNCI* 63:1351-1357, 1979.
15. Stevens RG, Lee JAH, Moolgavkar SH: No association between oral contraceptives and malignant melanoma. *N Engl J Med* 302:966, 1980.
16. Moolgavkar SH: The Neyman-Scott carcinogenesis model for low-dosage extrapolation. *Math Biosci* 50:155-156, 1980.
17. Moolgavkar SH, Day NE, Stevens RG: Two-stage model for carcinogenesis: Epidemiology of breast cancer in females. *JNCI* 65:550-569, 1980.
18. Moolgavkar SH: Multistage models for carcinogenesis. *JNCI* 65:25, 1980.
19. Moolgavkar SH, Knudson AG: Mutation and cancer: A model for human carcinogenesis. *JNCI* 66:1037-1052, 1981.
20. Moolgavkar SH, Stevens RG: Smoking and cancers of bladder and pancreas: Risks and temporal trends. *JNCI* 67:15-23, 1981.
21. Stevens RG, Moolgavkar SH, Lee JAH: Temporal trends in breast cancer. *Am J Epidemiol* 115:759-777, 1982.
22. Moolgavkar SH: Risk assessment using vital data. In "Environmental Epidemiology: Risk Assessment." Proceedings of a SIMS Conference, RL Prentice and AS Whittemore, eds., SIAM, pp 175-192, 1982.
23. Moolgavkar SH: Model for human carcinogenesis: Action of environmental agents. *Environ Health Perspect* 50:285-291, 1983.
24. Moolgavkar SH: A model for human carcinogenesis: Hereditary cancers and

- pre-malignant lesions. Proceedings of the Seventh Chicago Cancer Symposium, "Cancer: Etiology and Prevention," RG Crispin, ed, Elsevier Science Publishing Co., Inc. pp. 71-77, 1983.
25. Venzon DJ, Moolgavkar SH: Cohort analysis of malignant melanoma in five countries. Am J Epidemiol 119:1,62-70, 1984.
 26. Stevens RG, Moolgavkar SH: A cohort analysis of lung cancer and smoking in British males. Am J Epidemiol 119:624-641, 1984.
 27. Stevens RG, Moolgavkar SH: Malignant melanoma: Dependence of site-specific risk on age. Am J Epidemiol 119:890-895, 1984.
 28. Moolgavkar SH: Antioncogenes and cancer. In: "Pathophysiological Aspects of Cancer Epidemiology", G. Mathe', P. Reizenstein, eds., Pergamon Press, 19-30, 1985.
 29. Moolgavkar SH: Mutation and human cancer. In "Pathophysiological Aspects of Cancer Epidemiology", G. Mathe', P. Reizenstein, eds., Pergamon Press, 31-38, 1985.
 30. Moolgavkar SH, Lustbader ED, Venzon DJ: A geometric approach to non-linear regression diagnostics with application to matched case-control studies. Ann Statist 12:816-826, 1984.
 31. Stevens RG, Moolgavkar SH: Smoking and cancer in Britain. Proceedings of the Fifth World Conference on Smoking and Health, 1984.
 32. Moolgavkar SH: Some comments on the resources at RERF. In "Utilization and Analysis of Radiation Effects Research Foundation Data." Proceedings of a SIMS Conference, RL Prentice and DJ Thompson, eds., SIAM, pp. 274-279, 1984.
 33. Lustbader ED, Moolgavkar SH, Venzon DJ: Tests of the null hypothesis in case-control studies. Biometrics 1017-1024, 1984.
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 35. Lustbader ED, Moolgavkar SH: A diagnostic for the score test. J Amer Stat Assoc 80:375-379, 1985.
 36. Moolgavkar SH, Stevens RG, Lee JAH: Age and breast cancer incidence. European Journal of Cancer and Clinical Oncology 20:1453-1454, 1984.
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 38. Moolgavkar SH: Carcinogenesis modelling: from molecular biology to epidemiology. Annual Review of Public Health 7:151-170, 1986.
 39. Moolgavkar SH, Venzon DJ: Confidence regions for case-control and survival studies with general relative risk functions. In: "Modern Statistical Methods in Chronic Disease Epidemiology", Proceedings of a SIMS Conference, SH Moolgavkar and RL Prentice, Editors, John Wiley, 1986.
 40. Knudson AG, Moolgavkar SH: Inherited influences on susceptibility to radiation carcinogenesis. In: "Radiation Carcinogenesis," AC Upton, ed., Elsevier/North Holland, 1986.
 41. Prentice RL, Moolgavkar SH, Farewell VT: Biostatistical issues and concepts in epidemiologic research. Journal of Chronic Diseases 38:1169-1183, 1986.
 42. Moolgavkar SH: Hormones and multistage carcinogenesis. Cancer Surveys 5:635-

- 648, 1986.
43. Moolgavkar SH, Venzon DJ: Confidence regions in curved exponential families: Application to matched case-control and survival studies with general relative risk function. Annals of Statistics 15:346-359, 1987.
 44. Moolgavkar SH, Venzon DJ: Confidence regions for parameters of the proportional hazards model: A simulation study. Scand J Statist 14:43-56, 1987.
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 47. Moolgavkar SH, Venzon DJ: General relative risk models for epidemiologic studies. Am J Epidemiol 126:949-961, 1987.
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 51. Moolgavkar SH, Dewanji A: Discussion of "From Mouse to Man: The Quantitative Assessment of Cancer Risks" by DA Freedman and H Zeisel. Statistical Science, 3:39-41, 1988.
 52. Moolgavkar SH, Dewanji A, Venzon DJ: A Stochastic two-stage model for cancer risk assessment I: The hazard function and the probability of tumor. Risk Analysis, 8:383-392, 1988.
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 54. Moolgavkar SH: Biologically motivated two-stage model for cancer risk assessment. Tox. Letters, 43:139-150, 1988.
 55. Dewanji A, Venzon DJ, Moolgavkar SH: A stochastic two-stage model for cancer risk assessment II: The number and size of premalignant clones. Risk Analysis 9:179-186, 1989.
 56. Moolgavkar SH: Multistage models for cancer risk assessment. In Biologically Based Methods for Cancer Risk Assessment. C. Travis (ed.), NATO ASI Series A: Life Science Vo. 159, Plenum NY, 1989, 9-20.
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 61. Hahn RA, Moolgavkar SH: Nulliparity, decade of first birth and breast cancer in Connecticut cohorts. Am. J. Public Health 79:1503-1507, 1989.

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63. Moolgavkar SH, Cross FT, Luebeck G, Dagle GE: A two-mutation model for radon-induced lung tumors in rats. Radiation Research 121:28-37, 1990.
64. Moolgavkar SH, Luebeck G: Two-event model for carcinogenesis: biological, mathematical and statistical considerations. Risk Analysis 10:323-341, 1990.
65. Moolgavkar SH, Luebeck G, DeGunst M: Two mutation model for carcinogenesis: Relative roles of somatic mutations and cell proliferation in determining risk. In *Scientific Issues in Quantitative Cancer Risk Assessment*, SH Moolgavkar (ed.), Birkhauser Boston, 1990, 136-152.
66. Moolgavkar SH, Luebeck G., de Gunst M, Port RE, Schwarz M: Quantitative analysis of enzyme altered foci in rat hepatocarcinogenesis experiments. Carcinogenesis 11:1271-1278, 1990.
67. Moolgavkar SH: Cancer Models, invited editorial. Epidemiology 1:419-420, 1990.
68. Luebeck EG, Moolgavkar SH: Stochastic analysis of intermediate lesions in carcinogenesis experiments. Risk Analysis 11:149-157, 1991.
69. Dewanji A, Moolgavkar SH, Luebeck EG: Two-mutation model for carcinogenesis: Joint analysis of premalignant and malignant lesions. Math. Biosciences 104:97-109, 1991.
70. Nandakumar A, Davis S, Moolgavkar S, Witherspoon R, Schwartz S: Myeloid leukemia following therapy for a first primary cancer. Br J Cancer 63:782-788, 1991.
71. Moolgavkar SH: Cell proliferation in carcinogenesis (letter). Science 251:143, 1991.
72. Moolgavkar SH, Luebeck EG: The role of somatic mutations and cell replication kinetics in quantitative cancer risk assessment. In "Chemically Induced Cell Proliferation: Implications for Risk Assessment" BE Butterworth, TJ Sлага, W Farland, M McClain, eds., Wiley Liss, pp 469-479, 1991.
73. Moolgavkar SH. Carcinogenesis models: An overview. In "Indoor Radon and Lung Cancer: Reality or Myth?", FT Cross, ed., Battelle Press, pp 767-781, 1992.
74. Luebeck EG, Moolgavkar SH, Buchman A, Schwarz M: Effects of polychlorinated biphenyls in rat liver: Quantitative analysis of enzyme altered foci. Toxicology and Applied Pharmacology, 111: 469 - 484, 1991.
75. Moolgavkar SH, Luebeck EG: Multistage carcinogenesis: A population-based model for colon cancer. JNCI, 84: 610 - 618, 1992.
76. Moolgavkar SH: Cancer models. In "Biophysical Modelling of Radiation Effects", K Chadwick, G Moschini, M Varma eds., Adam Hilger, Bristol 1992, 239 - 252.
77. Luebeck EG, Moolgavkar SH: Stochastic description of initiation and promotion in experimental carcinogenesis. Annali dell'Istituto Superiore di Sanita 27: 575 - 580, 1991.
78. Moolgavkar SH, Luebeck EG: Interpretation of labelling indices in the presence of cell death. Carcinogenesis, 13: 1007 - 1010, 1992.
79. Moolgavkar SH, Luebeck EG. Risk assessment of non-genotoxic carcinogens. Toxicology Letters, 64/65: 631-636, 1992.
80. Moolgavkar SH: A population perspective on multistage carcinogenesis in

- "Multistage Carcinogenesis", Proceedings of the 22nd International Symposium of The Princess Takamatsu Cancer Research Fund, ed. CC Harris, S Hirohashi, N Ito, HC Pitot, T Sugimura, M Terada and J Yokota. Japan Scientific Societies Press, Tokyo, 1992, 381-392.
81. Moolgavkar SH, Luebeck EG, Krewski D, Zielinski JM: Radon, cigarette smoke, and lung cancer: A reanalysis of the Colorado Plateau miners' data. Epidemiology, 4: 204-217, 1993.
 82. Moolgavkar SH, Luebeck EG: A two-mutation model for radiation carcinogenesis in humans and rodents. In "New Frontiers in Cancer Causation" OH Iversen (ed.), Taylor and Francis, Washington, D.C., 1993, 199-210.
 83. Zheng CJ, Byers B, Moolgavkar SH: Allelic instability in mitosis: A unified model for dominant disorders. Proc. Natl. Acad. Sci. USA, 90: 10178-10182, 1993.
 84. Luebeck EG, Moolgavkar SH: Simulating the process of carcinogenesis, Math Biosciences, 123: 127-146, 1994.
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 87. Stayner L, Smith R, Bailer J, Luebeck EG, Moolgavkar SH: Methods for modelling occupational studies for cancer risk assessment. American J Industrial Med, 27: 155-170, 1995.
 88. Moolgavkar SH: Air pollution and mortality (letter) N. Eng J Med, 330: 1237-1238, 1994.
 89. Moolgavkar SH: Biological models of carcinogenesis and quantitative cancer risk assessment. Guest Editorial. Risk Analysis, 14: 879-882, 1994.
 90. Moolgavkar SH, Luebeck EG, Hall TA, Anderson EL: Particulate air pollution, sulfur dioxide, and daily mortality: A reanalysis of the Steubenville data. Inhalation Toxicology, 7: 35-44, 1995.
 91. Schwarz M, Buchmann A, Stinchcombe S, Luebeck EG, Moolgavkar SH, Bock KW: Role of receptors in human and rodent hepatocarcinogenesis. Mutation Research, 1995.
 92. Luebeck EG, Grasl-Kraupp B, Timmermann-Trosiener I, Bursch W, Schulte-Hermann R, Moolgavkar SH: Growth kinetics of enzyme altered liver foci in rats treated with phenobarbital or α -hexachlorocyclohexane. Toxicology and Applied Pharmacology, 130: 304-315, 1995.
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 96. Luebeck EG, Curtis SB, Cross FT, Moolgavkar SH: Two-stage model of radon-induced malignant lung tumors in rats: effects of cell killing. Radiation Research,

- 145: 163-173, 1996.
97. Moolgavkar SH, Luebeck EG, Buchmann A, Bock KW: Quantitative analysis of enzyme-altered foci in rats initiated with diethylnitrosamine and promoted with 2,3,7,8-tetrachlorodibenzo-p-dioxin or 1,2,3,4,6,7,8-heptachloro-p-dioxin. Toxicology and Applied Pharmacology, 138: 31-42, 1996.
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 100. Leroux BG, Lesenring WM, Moolgavkar SH, Faustman EM: A biologically based dose-response model for developmental toxicology, Risk Analysis, 16: 449-458, 1996.
 101. Dewanji A, Luebeck EG, Moolgavkar SH: A biologically-based model for the analysis of premalignant foci of arbitrary shape. Mathematical Biosciences, 135: 55-68, 1996.
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- and Prediction of Cancer Risk' eds. Moolgavkar SH, Krewski D, Zeise L, Cardis E, Moller H; IARC Scientific Publications 131, 1999, pp 61-74.
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 142. Curtis SB, Hazelton WD, Luebeck EG, Moolgavkar SH. From mechanism to risk estimation – bridging the chasm. *Advances in Space Research* 34:1404-1409, 2004.
 143. Moolgavkar SH Fifty years of the multistage model: remarks on a landmark paper. *Int J. Epidemiol*, 33:1182-1183, 2004.

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148. Luebeck EG, Buchmann A, Schneider D, Moolgavkar SH, Schwarz M. Modulation of Liver Tumorigenesis in Connexin32-deficient Mouse. *Mut. Res.* 570:33-47, 2005.
149. Moolgavkar SH. A review and critique of the EPA's rationale for a fine particle standard. *Reg Toxicol and Pharmacol.* 42:123-144, 2005.
150. Hazelton WD, Clements MS, Moolgavkar SH. Multistage carcinogenesis and lung cancer mortality in three cohorts. *Cancer Epidemiology, Biomarkers, Prevention.* 14:1171-1181, 2005.
151. Clements MS, Armstrong B, Moolgavkar SH. Lung cancer rate predictions using generalized additive models. *Biostatistics.* 6:576-589, 2005.
152. Dewanji A, Luebeck EG, Moolgavkar SH. A generalized Luria-Delbruck process. *Mathematical Biosciences.* 197:140-152, 2005.
153. Meza R, Luebeck EG, Moolgavkar SH. Gestational mutations and carcinogenesis. *Mathematical Biosciences.* 197:188-210, 2005.
154. Zheng CJ, Luebeck EG, Byers B, Moolgavkar SH. On the number of founding germ cells in humans. *Theor Biol Med Model.* 24:2:32, 2005.
155. Hazelton WD, Moolgavkar SH, Curtis SB, Zielinski JM, Ashmore JP, Krewski D. Biologically based analysis of lung cancer incidence in a large Canadian occupational cohort with low-dose ionizing radiation exposure, and comparison with Japanese atomic bomb survivors. *J. Toxicol Environ Health.* In Press.
156. Moolgavkar SH. Fine particles and mortality. *Inhalation Toxicology.* 18:93-94, 2006.
157. Jeon J, Luebeck EG, Moolgavkar SH. Age effects and temporal trends in adenocarcinoma of esophagus and gastric cardia. *Cancer Causes & Control*, in press.

Books

1. Modern Statistical Methods in Chronic Disease Epidemiology. SH Moolgavkar and RL Prentice, Editors, John Wiley, 1986.
2. Tobacco Smoking, IARC monographs on the evaluation of the carcinogenic risk of chemicals to humans, Volume 38, IARC, Lyon, 1986 (member of the working group).

3. Scientific Issues in Quantitative Cancer Risk Assessment. SH Moolgavkar, Editor, Birkhauser Boston, 1990.
4. Quantitative Estimation and Prediction of Human Cancer Risk. SH Moolgavkar, D Krewski, L Zeise, E Cardis and H Moller, Editors, IARC Scientific Publications 131, 1999.

Selected Professional Activities

- Editorial Board of "Genetic Epidemiology", 1984-88
- Member, IARC (International Agency for Research on Cancer) working group on Tobacco Smoking
- Session Chairman at International Symposium: "Time Related Factors in Cancer Epidemiology", held at NIH in April 1985
- Co-chairman of SIMS conference "Modern Statistical Methods in Chronic Disease Epidemiology" held in Alta, Utah in June 1985
- Member, NIH Special Study Section for Biometry
- Member, NSF panel to review Scientific bases of risk assessment methodologies
- Member, Advisory Committee to review risk assessment program of Armstrong Laboratories, Wright-Patterson Air Force Base, 1987
- Member, External Scientific Committee to review the program of the Radiation Epidemiology Branch, NCI, 1987
- Consultant, Fox Chase Cancer Center
- Consultant, University of Nebraska Medical Center
- Consultant, Health and Welfare, Canada
- Organizer and Chair, SIMS conference "Scientific Issues in Quantitative Cancer Risk Assessment", held in Snowbird, Utah, June 1989
- Member, Scientific Advisory Panel to review Risk Assessment program of the National Center for Toxicologic Research, 1992.
- Member, Scientific Advisory Panel to review the EPA Dioxin Health Assessment document, 1992.
- Member, Scientific Advisory Panel to the CIIT Centers for Health Research, 1992 - present.
- Member, Working Group on quantitative estimation and prediction of cancer risk, IARC, Lyon, 1993.
- Senior Editor of monograph 'Quantitative Estimation and Prediction of Cancer Risk' IARC Scientific Publications, No. 131, 1999.
- Member, Health Effects Institute Expert Panel for re-analyses of critical air pollution studies, 1997 - 2000.
- Co-chairman, International Conference on Mathematical Models in Cancer, Park City, Utah, 1998.
- Area Editor for Health and Environment, *Risk Analysis - An International Journal*. Jan 2000 - present .
- Member, External Science Advisory Board, RISC-RAD project of the European Union, ongoing.
- Member, External Science Advisory Board, California Air Resources Board, ongoing.

- Invited Expert, Workshop on Mechanisms of Fiber Carcinogenesis, IARC, Lyon, France, November, 2005.

Selected Invited Talks

- International Symposium, "Time Related Factors in Cancer Epidemiology", NIH, April, 1985
- SIMS conference, "Modern Statistical Methods in Chronic Disease Epidemiology", Alta, Utah, June 1985
- Seminar, "Stochastic Models for Carcinogenesis and Risk Assessment", EPA, Washington, DC, 1985.
- Seminar, "General Relative Risk Models for Case-Control Studies", Johns Hopkins University, School of Public Health, Baltimore, MD, 1985.
- Seminar, "Two-Stage Model for Carcinogenesis and the IPI Protocol", Battelle PNL, Richland, WA, 1986.
- School of Public Health grand rounds, "A Cohort Analysis of Smoking and Cancers of the Lung, Bladder and Pancreas", Department of Biostatistics Seminar "General Relative Risk Regression Models for Epidemiologic Studies", University of Pittsburgh, Pittsburgh, January 1987
- Symposium on Quantitative Assessment of Cancer Risk, "Two-Stage Model for Carcinogenesis: Implications for Risk Assessment", Washington, DC, February 1987
- Risk Assessment Workshop, "Biologically-Based Carcinogenesis Models for Risk Assessment", Washington, DC, March 1987
- American Statistical Association Annual Meeting, "Origin Invariant Relative Risk Functions", "Multi-Stage Models for Cancer Risk Assessment", San Francisco, August 1987
- EPA Toxicology and Microbiology Seminar Series, "Two Mutation Model for Cancer Risk Assessment", Cincinnati, October 1987
- 17th Conference on Toxicology, "Biologically Motivated Two-Stage Model for Carcinogenesis", Wright-Patterson Air Force Base, Dayton, November 1987
- University of Wisconsin Seminars, "Two-Stage Model for Carcinogenesis", Department of Human Oncology, "Curvature and Inference in Exponential Families: Application to Relative Risk Regression Models", Department of Statistics, Madison, November 1987
- Fox Chase Cancer Center Seminar, "Cox Regression for the Innocent Bystander", Philadelphia, December, 1987
- Biopharmaceutical Section of ASA, gave a tutorial and short course on "Modern Statistical methods in Chronic Disease Epidemiology" in conjunction with Ross Prentice (five lectures each), Newark, December 1987
- Risk Assessment Workshop, "Biologically-Based Carcinogenesis Models for Risk Assessment", Washington, DC, March 1988
- Health and Welfare Canada, "Biologically-Based Carcinogenesis Models for Risk Assessment", Ottawa, March 1988
- Carleton University, "Curvature and Inference in Exponential Families: Application to

- Relative Risk Regression Models", Ottawa, March 1988
- University of Nebraska Medical Center, "A Two-Stage Model for Carcinogenesis and its Implications for Risk Assessment", May 1988
 - NATO Workshop on Biologically-Based Methods for Cancer Risk Assessment, "Cancer Models and Risk Assessment", Corfu, Greece, June 1988
 - Radiation Research Society, Annual Meeting, Seattle, WA, 1989
 - SIMS Conference, Alta, Utah, 1989
 - McArdle Laboratory, University of Wisconsin, Madison, 1989
 - Society for Risk Analysis, Annual Meeting, San Francisco, CA, 1989
 - International Conference, "Chemically Induced Cell Proliferation: Implications for Risk Assessment", Austin, Texas, 1989
 - Invited Participant, Workshop on Risk Assessment for Benzene, Georgetown University, 1989
 - University of Cincinnati, Environmental Health Center, 1990
 - University of Pittsburgh, Department of Biostatistics, 1990
 - University of Illinois, Center for Environmental Studies, 1990
 - German Cancer Research Center, Heidelberg, Germany, 1990
 - University of Tübingen, Tübingen, 1990
 - University of Vienna Cancer Center, Vienna, Austria, 1990
 - BASF, Toxicology group, Mannheim, 1990
 - International Cancer Congress, Hamburg, 1990
 - National Academy of Sciences, Committee on Risk Assessment Methodology, Washington, DC, 1990
 - Hanford Symposium on Health and the Environment, Battelle PNL, Richland, 1990
 - Joint U.S., Japan Cancer Meeting, Hawaii, 1991
 - International Workshop "Biophysical Modelling of Radiation Carcinogenesis", Padua, Italy, 1991
 - NATO Workshop on Risk Assessment, Athens, Greece, 1991
 - Princess Takamatsu Cancer Congress, Tokyo, Japan, 1991
 - International conference on Cell Proliferation in Carcinogenesis, NIEHS, North Carolina, 1992
 - International Toxicology Conference, Rome, Italy, 1992
 - Workshop on Risk Assessment and Low Dose Extrapolation, Zurich, Switzerland, 1992
 - International Workshop on Mouse Liver Tumors, Washington D.C., 1992
 - European Toxicology Meeting, Mainz, Germany, 1993
 - International Symposium on Quantitative Risk Assessment, Research Triangle Park, NC, 1993
 - AACR International Workshop on Risk Assessment, Whistler BC, 1994.
 - Society for Risk Analysis sessions on cancer risk assessment and on air pollution, Honolulu, 1995.
 - HEI workshop on Diesel Exhaust, San Francisco, 1996.
 - Berkeley symposium on Benzene and Leukemia, Napa Valley, 1996.
 - International symposium on low-dose and low-dose-rate radiation, Stratford-on-Avon, UK, 1997 (invited keynote speaker).
 - International symposium on Health Effects of Particulate Air Pollution, Prague, 1997

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(invited speaker).

- International symposium on Statistics in the Environment, Enschede, The Netherlands, 1997 (invited speaker).
- Seminar speaker, Netherlands Institute for Health and the Environment, 1997.
- International meeting of the Bernoulli Society, Calcutta, India, 1997 (invited speaker).
- Sixth European Meeting on Hepatocarcinogenesis, Vienna, September 1999, invited speaker.
- International Workshop on Mathematical Models in Radiation Carcinogenesis, Kyoto, March, 2001, invited speaker.
- International Biometrics Conference, Homburg, Germany, March 2001, invited speaker.
- Environmental Mutagen Society, Annual Meeting, Miami, May 2003, Invited Speaker.
- International Congress of Radiation Research, Brisbane, Australia, August 2003, Invited Speaker.
- Meeting the Environmental Challenge of the 21st Century, Monterey, California, March 2003, Invited Speaker.
- COSPAR meeting, Paris, July 2004, invited speaker.
- IARC, Lyon, France, July 2004, invited speaker.